

WHAT IS CLAIMED IS:

1. An apparatus for searching corresponding points between an input image and a reference image which is an object of comparison with the input image, said apparatus  
5 comprising:

a similarity degree image production unit which produces a plurality of similarity degree images each having a similarity degree between the input image and the reference image as a pixel value; and

10 a corresponding point detection unit which detects corresponding points between the input image and the reference image based on the similarity degree images produced by said similarity degree image production unit.

15 2. The apparatus according to claim 1, wherein said similarity degree image production unit includes,

a reference partial image production unit which divides the reference image into a plurality of blocks and thereafter produces a reference partial image;

20 an input partial image production unit which divides the input image into a plurality of blocks and thereafter produces an input partial image; and

a similarity degree calculation unit which calculates the similarity degree between the input partial image and  
25 the reference partial image.

3. The apparatus according to claim 2, wherein said reference partial image production unit divides the reference image into a plurality of blocks and generates a plurality of reference partial images; and

5        said input partial image production unit produces a plurality of input partial images each of whose size is greater than a size of each of the reference partial images and the each of which is obtained by dividing said input image into a plurality of blocks whose parts are mutually  
10 overlapped.

4. The apparatus according to claim 2, wherein said similarity calculation unit defines an Euclid distance or a normalized correlation coefficient between the input  
15 partial image and the reference partial image as a similarity degree.

5. The apparatus according to claim 1, wherein said corresponding point detection unit includes,

20        an accumulation addition unit which sequentially accumulation-adds a pixel value of pixel around each pixel of a plurality of similarity degree images arranged in a predetermined direction to a pixel value of the other pixel; and

25        a corresponding point specific unit which specifies

corresponding points based on each of similarity degree image  
accumulatively added by said accumulation addition unit.

6. The apparatus according to claim 5, wherein said  
5 accumulation-addition unit recursively repeats  
accumulation-addition calculation in a horizontal  
direction, a direction opposite to the horizontal direction,  
a vertical direction, and a direction opposite to the  
vertical direction.

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7. The apparatus according to claim 5, wherein said  
accumulation-addition unit recursively repeats  
accumulation-addition in a horizontal direction, a  
direction opposite to the horizontal direction, a vertical  
15 direction, and a direction opposite to the vertical direction  
until a width of variance of position of a maximum value  
in each of the similarity degree images becomes smaller than  
a predetermined value.

20 8. The apparatus according to claim 5, wherein said  
corresponding point specific unit defines a pixel position  
of pixel whose pixel value of each of the similarity degree  
images additionally added by said accumulation addition unit  
which becomes maximum, as the corresponding points.

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9. The apparatus according to claim 5, wherein said accumulation-addition unit sequentially accumulation-adds each of maximum pixel values from among each of pixel values of peripheral pixels.

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10. A method of searching corresponding points between an input image and a reference image which is an object of comparison with the input image, the method comprising:

a similarity degree image production step of producing  
10 a plurality of similarity degree images each having a similarity degree between the input image and the reference image as a pixel value; and

a corresponding point detection step of detecting  
corresponding points between the input image and the  
15 reference image based on the plurality of similarity degree image produced in the similarity degree image production step.

11. The method according to claim 10, wherein the  
20 similarity degree image production step includes,

a reference partial image production step of dividing the reference image into a plurality of blocks and thereafter produces a reference partial image;

an input partial image production step of dividing  
25 the input image into a plurality of blocks and thereafter

produces an input partial image; and

a similarity degree calculation step of calculating the similarity degree between the input partial image and the reference partial image.

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12. The method according to claim 11, wherein the reference partial image production step divides the reference image into a plurality of blocks and generates a plurality of reference partial images; and

10        said input partial image production step produces a plurality of input partial images each of whose size is greater than a size of each of the reference partial images and the each of which is obtained by dividing said input image into a plurality of blocks whose parts are mutually  
15 overlapped.

13. The method according to claim 11, wherein the similarity calculation step defines an Euclid distance or a normalized correlation coefficient between the input  
20 partial image and the reference partial image as a similarity degree.

14. The method according to claim 10, wherein the corresponding point detection step includes,  
25 an accumulation addition step of sequentially

accumulation-adding a pixel value of pixel around each pixel of a plurality of similarity degree images arranged in a predetermined direction to a pixel value of the other pixel, and

5           a corresponding point specific step of specifying corresponding points based on each of similarity degree image accumulatively added in the accumulation addition step.

15.   The method according to claim 14, wherein the  
10 accumulation addition step recursively repeats accumulation-addition calculation in a horizontal direction, a direction opposite to the horizontal direction, a vertical direction, and a direction opposite to the vertical direction.

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16.   The method according to claim 14, wherein the accumulation addition step recursively repeats accumulation-addition calculation in a horizontal direction, a direction opposite to the horizontal direction,  
20 a vertical direction, and a direction opposite to the vertical direction until a width of variance of position of a maximum value in each of similarity degree images becomes smaller than a predetermined value.

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17. The method according to claim 14, wherein the corresponding point specific step defines a pixel position of pixel whose pixel value of each of the similarity degree images additionally added by the accumulation addition step  
5 which becomes maximum, as the corresponding points.

18. The method according to claim 14, wherein the accumulation-addition step sequentially and accumulatively adds each of maximum pixel values from among each of pixel  
10 values of peripheral pixels.

19. A computer program containing instructions which when executed on a computer realizes a method of searching corresponding points between an input image and a reference  
15 image which is an object of comparison with the input image, the method comprising:

a similarity degree image production step of producing a plurality of similarity degree images each having a similarity degree between the input image and the reference  
20 image as a pixel value; and

a corresponding point detection step of detecting corresponding points between the input image and the reference image based on the plurality of similarity degree image produced in the similarity degree image production  
25 step.

20. The computer program according to claim 19, wherein the similarity degree image production step includes,

a reference partial image production step of dividing the reference image into a plurality of blocks and thereafter  
5 produces a reference partial image;

an input partial image production step of dividing the input image into a plurality of blocks and thereafter produces an input partial image; and

a similarity degree calculation step of calculating  
10 the similarity degree between the input partial image and the reference partial image.

21. The computer program according to claim 20, wherein the reference partial image production step divides the  
15 reference image into a plurality of blocks and generates a plurality of reference partial images; and

said input partial image production step produces a plurality of input partial images each of whose size is greater than a size of each of the reference partial images  
20 and the each of which is obtained by dividing said input image into a plurality of blocks whose parts are mutually overlapped.



22. The computer program according to claim 20, wherein the similarity calculation step defines an Euclid distance or a normalized correlation coefficient between the input partial image and the reference partial image as a similarity  
5 degree.

23. The computer program according to claim 19, wherein the corresponding point detection step includes,  
an accumulation addition step of sequentially  
10 accumulation-adding a pixel value of pixel around each pixel of a plurality of similarity degree images arranged in a predetermined direction to a pixel value of the other pixel, and  
a corresponding point specific step of specifying  
15 corresponding points based on each of similarity degree image accumulatively added in the accumulation addition step.

24. The computer program according to claim 23, wherein the accumulation addition step recursively repeats  
20 accumulation-addition calculation in a horizontal direction, a direction opposite to the horizontal direction, a vertical direction, and a direction opposite to the vertical direction.

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25. The computer program according to claim 23, wherein the accumulation addition step recursively repeats accumulation-addition calculation in a horizontal direction, a direction opposite to the horizontal direction, a vertical direction, and a direction opposite to the vertical direction until a width of variance of position of a maximum value in each of similarity degree images becomes smaller than a predetermined value.

10 26. The computer program according to claim 23, wherein the corresponding point specific step defines a pixel position of pixel whose pixel value of each of the similarity degree images additionally added by the accumulation addition step which becomes maximum, as the corresponding  
15 points.

27. The computer program according to claim 23, wherein the accumulation-addition step sequentially and accumulatively adds each of maximum pixel values from among  
20 each of pixel values of peripheral pixels.